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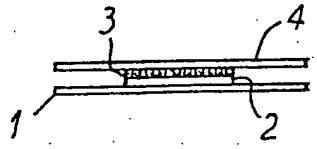
(54) **Decorative heat transfer and method of making the same**

(57) A decorative heat transfer comprises (a) a layer 2 of heat-activatable adhesive in the shape of the transfer, (b) adhering to the said heat-activatable adhesive, a layer 3 of a particulate decorative material, which is also in the shape of the transfer, and (c) overlying the said particulate decorative material, and adhered thereto by means of a temperature stable contact adhesive, a temperature-stable film 4, the layer 2 of heat-activatable adhesive (a) being either uncovered or protected by means of a release substrate 1. In use, any release substrate is removed and the transfer heat-pressed onto a fabric after which film 4 is peeled away.

FIG.5



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The drawings originally filed were informal and the print here reproduced is taken from a later filed formal copy.

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FIG.1

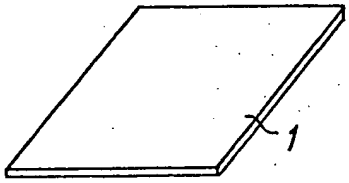


FIG.2

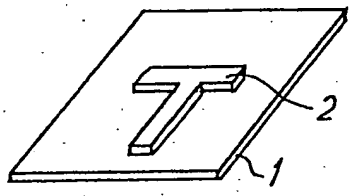


FIG.3

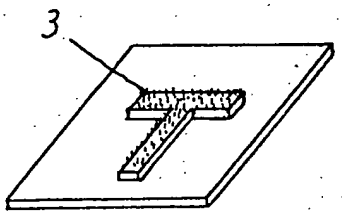


FIG.4

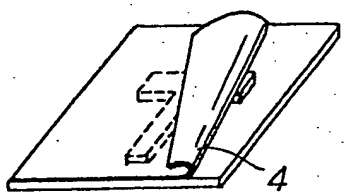


FIG.5

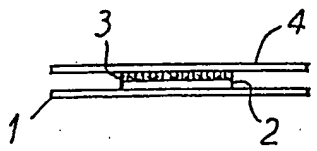
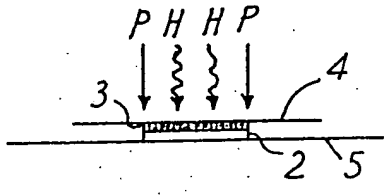


FIG.6



SPECIFICATION

Decorative heat transfer and method of making the same

The present invention relates to the art of decorative heat transfers of the kind which can be applied to many different kinds of surfaces, particularly surfaces of fabrics and textiles in the form of garments.

It is known from British Patent Specification No. 1,510,414 that a flocked heat transfer can be made by applying a layer of heat-curable adhesive in a pattern on a thermoplastics film, flocking the adhesive pattern, placing an open mesh carrier over the flocked adhesive patter and vacuum drawing the film into the carrier using heat to liquify the thermoplastics film which impregnates the carrier in the background areas of the flocked pattern. The resulting transfer may be applied to a final textile surface by heat pressing; the background areas being pulled away with the carrier to leave the flocked pattern secured to the textile surface.

The transfer made by the method according to British Patent Specification No. 1,510,414 has certain drawbacks associated with its application to fabrics. One such drawback is that the thermoplastics film has a tendency to interfere with the penetration of the adhesive into the fabric. The resulting transfer is not as securely attached to the fabric as may be desired.

Furthermore, the method of making the transfer according to British Patent Specification No. 1,510,414 includes a vacuum drawing step which complicates and increases the cost of manufacturing transfers.

German OS 2838814 describes a process for making decorative heat transfers by the steps of:

a) flocking the entire surface of a lightly glued substrate,
b) applying to the surface of the flock, in a pattern which is the reverse of the desired pattern of the transfer, an adhesive which is activated at elevated temperature,
c) placing the resulting transfer adhesive side down on the fabric to which the transfer is applied,
d) applying heat to activate the adhesive and bond the transfer firmly to the fabric, and
e) peeling off the original lightly glued substrate and the surplus flock material.

This method has two significant disadvantages. First it is wasteful of flock, since the area of application of flock is not limited to the area of the transfer. Second, the transfer and the area surrounding it are necessarily opaque (because they are flocked) and it is therefore difficult to position the transfer accurately, which may be important if the fabric is striped or patterned.

The present invention provides a decorative heat transfer comprising:

a) a layer of a heat-activatable adhesive in the shape of the transfer,
b) adhering to the said heat-activatable adhesive, a layer of a particulate decorative material which is also in the shape of the transfer,
c) overlying the said particulate decorative material and adhered thereto by means of a temperature stable contact adhesive, a temperature stable film,

the layer of heat-activatable adhesive a) being either uncovered or protected by means of a removable release substrate.

The present invention further provides a method for making a decorative heat transfer which method comprises:-

a) applying a heat-activatable adhesive to a release substrate in a desired pattern;
b) coating the heat-activatable adhesive with a particulate decorative material;
c) contacting the surface of the particulate decorative material with a second substrate which is coated, on the side to be contacted, with a temperature stable contact adhesive which bonds the second substrate to the surface of the particulate material more strongly than the heat-activatable adhesive bonds to the release substrate but less strongly than the heat-activatable adhesive bonds, after heat-activation, to the particulate material and to a final receiving fabric surface, to give a decorative heat transfer.

A decorative heat transfer of the invention may, after the removal of the release substrate, be secured to a final receiving fabric surface by heat pressing the transfer onto the fabric surface and then pulling away, after the fabric and transfer have cooled, the second substrate.

In the method of the invention a heat-activatable adhesive may be printed onto a release substrate. At the time of printing, the heat-activatable adhesive is in a liquid or semi-liquid state. For ease of application and for general convenience, it is highly preferred that the heat-activatable adhesive is liquid at room temperature. Although hot printing is within the scope of the present invention, it is not preferred for reasons of cost and safety. The heat-activatable adhesive is required to soften at elevated temperature to the extent that, when the transfer is heat pressed onto a fabric, it will penetrate the fibres of the fabric and will then solidify on cooling to secure the transfer on the surface of the fabric. Furthermore, the composition of the heat-activatable adhesive and the fusion temperature of the adhesive will be such that no damage to the fabric will be sustained during the application of the transfer to the fabric. Generally, the fusion temperature of the heat-activatable adhesive is in the range of from 130° to 160°C, preferably from 135° to 150°C. Any material, having the required adhesive characteristics can be used as the heat-activatable adhesive in the present invention. Preferably, however the heat-activatable adhesive is a plastisol of polyvinylchloride, a copolymer of vinyl chloride and vinyl acetate, preferably containing 5-10% vinyl acetate, or a mixture of these. The plasticizer chosen to make the plastisol is preferably selected from butyl benzyl phthalate or a

mixture of this with diisooctyl phthalate. It is anticipated that for certain applications it might be preferable or desirable to incorporate one or more additional materials into the adhesive composition. Such additional materials are well-known in the art and include, pigments, dyes, plasticizers, thickeners and thixotropic agents.

Titanium dioxide may be used as a white pigment. A thickener may be used, to give a paste of non-Newtonian properties, and particularly one which is thixotropic and pseudoplastic, has a yield value, and a good rheology, such that the particulate decorative material is held well in it.

The composition is also chosen to give a very low order of toxicity. One formulation which has given good results is:

95% polyvinyl chloride/5% polyvinyl acetate copolymer	100 p.b.w.
Butyl benzyl phthalate	80 p.b.w.
Titanium oxide paste in DIOP	4 p.b.w.
Aerosil	3 p.b.w.

The term "release substrate" is generally well-known in the art to mean a substrate having a surface which does not allow a particular material to bond strongly to that surface. Usually, in the present invention, the release substrate used is paper which has been surface treated with a releasing agent such as a silicone or a paraffin wax.

The heat-activatable adhesive is preferably printed in the desired pattern, design, logo or image using a screen printing technique. Such a technique may be used in a 'flat-bed' format for individual sheets or in a "rotary" format for continuous tape printing. Such techniques are well-known in the art and need not be described in detail here.

The heat-activatable adhesive is printed to have a layer thickness which is not so thin as to not support the decorative particulate material and merely soak completely into the surface of the receiving fabric when the transfer is heat pressed onto the fabric surface. Furthermore, the layer of adhesive on the release substrate must not be so thick that it will flow and thus change the pattern or give "fuzzy" edges to the pattern. An adhesive thickness of up to 0.2 mm, particularly in the range 0.05 mm to 0.1 mm, is preferred.

After printing, the heat-activatable adhesive is coated with a particulate decorative material. Suitable particulate materials include fibres of flock, glitter, other decorative, powdered or granular matter, and mixtures of these. Most preferably, the particulate material is flock. The coating can be applied by electrostatic, vibrational or air-spray techniques, all of which are well-known in the art, or a combination of these such that an even coating may be obtained. When flock is used as the decorative material, it is preferably applied to the adhesive pattern by the electrostatic method.

After the coating stage, the adhesive is generally pre-gelled or interim dried. This may be achieved where appropriate by the use of one or more of the means, well-known in the art, for gelling plastisols. The adhesive may conveniently be heated by means of short wave infra-red radiation. The temperature at which the pre-gelling occurs will amongst other things, of course, depend on the composition of the adhesive used. Generally the adhesive is formulated so that pre-gelling occurs in the range of from 65° to 85°C.

After the pre-gelling step, surplus particulate decorative material can be removed from the non-image areas by suitable means such as by brushing, suction, air blowing, vibration or a combination of these.

It may be desired or preferred that the particulate decorative material attached to the layer of pre-gelled, heat-activatable adhesive is dyed, coloured, printed or hued with suitable dye or pigment compositions to produce single- or multi-coloured designs. This is particularly preferred for an adhesive layer coated with neutral or white clock in which case the flock fibres will generally be dyed over their entire visible length by known techniques.

The second substrate, which is coated with a temperature-stable contact adhesive is generally used in the form of a sheet or a tape. The temperature-stable contact adhesive is an adhesive which is heat stable preferably up to above 200°C. This adhesive bonds the second substrate to the surface of the particulate material more strongly than the heat-activatable adhesive bonds to the release substrate at room temperature. However, after the finished transfer is heat pressed onto a receiving fabric, i.e. after the heat-activatable adhesive has been heat-activated or fused and set to its full strength, the peel adhesion of the second substrate to the surface of the particulate decorative material is less strong than the adhesion of the fused adhesive to the fibres of the fabric and to the particulate decorative material. Suitable materials for use as temperature stable contact adhesives in the present invention include silicon rubber adhesives. The second substrate on which this adhesive is coated must, like the adhesive, be capable of withstanding high temperatures, preferably up to above 200°C. Suitable materials for use as the second substrate include aluminium and plastics films in the form of sheets and tapes. Preferably, the second substrate is transparent or translucent. A suitable material is a tape commercially available from 3M Limited under the Code No. 8403. This tape comprises a transparent polyester film (thickness about 0.02 mm) having a coating (about 0.04 mm) of a silicone rubber adhesive and has heat stability up to 205°C (400°F).

Before the transfer can be applied to a final receiving fabric surface, the release substrate must be removed. The removal of this substrate can be carried out manually or by mechanical means. On the removal of the release substrate, the layer of particulate decorative material attached to the pre-gelled

adhesive layer adheres to the second substrate. If the transfer is not intended to be used immediately, it may be placed back onto the original carrier or a suitable release substrate.

The decorative heat transfers thus made according to the method of the invention may be stacked, stored or transported, given reasonable care, without risk of damage to the decorative or heat-activatable adhesive layer.

The transfer, with no release substrate, is applied to a final receiving fabric surface by placing the transfer onto the fabric surface with the pre-gelled heat-activatable adhesive layer in contact with the fabric surface and heat and pressure, supplied for example by a heat fusion press or a domestic hot iron, are applied for a sufficient length of time to cause the heat-activatable adhesive to fuse so that a proportion of the adhesive layer penetrates the weave of the fabric. The remaining portion of the adhesive layer adheres completely to the base of the decorative layer formed by the particulate decorative material. The heat is applied to the transfer to raise the temperature of the heat-activatable adhesive to its fusion temperature, i.e. within the range of from 130° to 160°C. Allowance should be made for the insulating properties of the second substrate and the decorative layer and the temperature of the heat source and the dwell time should be suitably adjusted. The dwell time will, of course, depend on the nature of the heat-activatable adhesive composition, the temperature applied, the pressure applied and the nature of the fabric. However, the dwell time will generally be in the range of from 10 to 45 seconds and preferably about 15 seconds.

The fabric with the transfer adhering is then removed from the heat source and is allowed to cool. After cooling, the second substrate attached to the surface of the decorative layer by the temperature stable contact adhesive is peeled off to leave the decorative transfer secured to the fabric.

The transfers made by the method of the present invention may be applied to a wide range of fabrics. Exceptionally good results are obtained on cotton and cotton/synthetic mixes such as cotton/polyester textiles. Two classes of unsuitable fabrics are non-porous synthetics and textiles with surface coatings such as shower-proofed garments.

An especially preferred embodiment of the method of the present invention will be described briefly with reference to the accompanying drawings in which:-

Figure 1 shows a perspective view of a sheet of release paper;

Figures 2 to *4* illustrate three steps in the process;

Figure 5 is a cross-sectional view of Figure 4; and

Figure 6 shows the transfer of Figure 5 being transferred by heat and pressure to a receiving surface.

A sheet of release paper (1) is printed with a layer (2) of a heat-activatable adhesive in a design (here shown as a T-shape). The layer (2) is then coated with flock, pre-gelled and cleared of any surplus flock to give a flock layer (3) on top of the adhesive layer. This flock layer is then covered with a temperature-stable film (4) which adheres to the flock layer by means of a temperature-stable contact adhesive coated on the underside of the film (4) thus producing a flocked heat transfer having a sandwich structure as illustrated in Figure 5. The transfer may then be applied, after the release paper (1) is removed, to a final receiving fabric surface (5) by the application of heat and pressure as illustrated in Figure 6.

Example

A release paper, surface coated with a silicone wax, is printed with a heat-activatable adhesive formulation comprising:-

95% polyvinyl chloride/5% polyvinyl acetate copolymer	-	100 Parts by weight
Butyl benzyl phthalate	-	80 Parts by weight
Titanium dioxide (paste in DIOP)	-	4 Parts by weight
Aerosil	-	3 Parts by weight

in a pattern. The pattern was coated with flock fibres electrostatically and the adhesive formulation was interim dried at 65°C using an infra-red lamp for 10 seconds. Surplus flock not attached to the adhesive layer was removed by vacuum/brushing. 3M 8403 temperature-stable contact adhesive tape was pressed down onto the top of the flocked layer and the release paper was peeled off.

The transfer was heat pressed onto a cotton sweater using a heat fusion press at a temperature of 155°C for 15 seconds and the transfer and sweater were allowed to cool to room temperature whereupon the 3M tape was peeled away to leave the transfer clearly secured to the sweater.

CLAIMS

1. A decorative heat transfer comprising:-
   (a) a layer of a heat-activatable adhesive in the shape of the transfer,
   (b) adhering to the said heat-activatable adhesive, a layer of a particulate decorative material which is also in the shape of the transfer,
   (c) overlying the said particulate decorative material and adhered thereto by means of a temperature-stable contact adhesive, a temperature stable film,

the layer of heat-activatable adhesive (a) being either uncovered or protected by means of a removeable

release substrate.

2. A transfer according to claim 1, wherein the particular decorative material is glitter, flock or a combination of these.

3. A transfer according to claim 2, wherein the particulate decorative material is flock.

4. A transfer according to claim 1, wherein the heat-activatable adhesive is one which has a fusion temperature in the range of from 130° to 160°C.

5. A transfer according to claim 4, wherein the heat-activatable adhesive is one which has a fusion temperature in the range of from 135° to 150°C.

6. A transfer as according to claim 1, wherein the heat-activatable adhesive is a plastisol comprising polyvinylchloride, a copolymer of vinyl chloride and vinyl acetate or a combination of these, and a plasticizer.

7. A transfer according to claim 6, wherein the copolymes of vinyl chloride and vinyl acetate contains from 5 to 10% by weight of vinyl acetate.

8. A transfer according to claim 6, wherein the plasticizer is butyl benzyl phthalate alone or in combination with di-isooctyl phthalate.

9. A transfer according to claim 1, wherein the layer of heat-activatable adhesive has a thickness of from 0.05mm to 0.1mm.

10. A transfer according to claim 1, wherein the temperature stable film is a sheet or tape of aluminium or plastics material.

11. A transfer according to claim 10, wherein the temperature stable film is a transparent polyester tape having a thickness of about 0.02mm.

12. A transfer according to claim 1, wherein the temperature stable contact adhesive is heat stable up to above 200°C.

13. A transfer according to claim 12, wherein the temperature stable contact adhesive is a silicone rubber adhesive having heat stability up to 205°C.

14. A transfer according to claim 1, wherein the layer of heat-activatable adhesive is protected by means of a sheet of waxed paper.

15. A method of making a decorative heat transfer which method comprises:-

i) applying a heat-activatable adhesive to a release substrate in a desired pattern,

ii) coating the heat-activatable adhesive with a particulate decorative material,

iii) contacting the surface of the particulate decorative material with a second substrate which is coated, on the side to be contacted, with a temperature-stable contact adhesive which bonds the second substrate to the surface of the particulate material more strongly than the heat-activatable adhesive bonds to the release substrate but less strongly than the heat-activatable adhesive bonds, after heat activation, to the particulate material and to a final receiving fabric surface, to give a decorative heat transfer.

16. A method according to claim 15, wherein the heat-activatable adhesive is one which has a fusion temperature in the range of from 130° to 160°C.

17. A method according to claim 16, wherein the heat-activatable adhesive is one which has a fusion temperature in the range of from 135° to 150°C.

18. A method according to claim 15, wherein the heat-activatable adhesive is a plastisol comprising polyvinylchloride, a compolymer of vinyl chloride and vinyl acetate or a combination of these, and a plasticizer.

19. A method according to claim 15, wherein the heat-activatable adhesive is applied to the release substrate in a liquid or semi-liquid state at room temperature.

20. A method according to claim 15, wherein the heat-activatable adhesive is applied to the release substrate in the desired pattern using a screen-printing technique.

21. A method according to claim 15, wherein the heat-activatable adhesive is applied to the release substrate as a layer having a thickness of from 0.05mm to 0.1mm.

22. A method according to claim 15, wherein the particulate material is flock, glitter or a mixture of these.

23. A method according to claim 22, wherein the particulate material is flock.

24. A method according to claim 15, wherein after the coating stage, the heat-activatable adhesive is pre-gelled or interim dried.

25. A method according to claim 24, wherein surplus particulate decorative material is removed after the pre-gelling or interim drying step.

26. A method according to claim 15, wherein the second substrate is a sheet or tape of aluminium or plastics material.

27. A method according to claim 26, wherein the second substrate is a transparent polyester tape having a thickness of about 0.02 mm.

28. A method according to claim 15, wherein the temperature-stable contact adhesive is heat stable up to above 200°C.

29. A method according to claim 28, wherein the temperature-stable contact adhesive is a silicone rubber adhesive having heat stability up to 205°C.

30. A method of applying a transfer according to claim 1 to a fabric surface, comprising (a) removing the release substrate if present, (b) placing the transfer onto the fabric surface with heat-activatable adhesive layer in contact with the fabric surface, (c) applying heat and pressure to the transfer for a sufficient length of time to cause the heat-activatable adhesive to fuse such that some of the fused adhesive penetrates the fabric surface, (d) allowing the fabric and transfer to cool; and then (e) peeling away the second substrate from the surface of the particulate decorative layer to leave the transfer fixed to the fabric surface.

31. A fabric or textile having a transfer according to claim 1, applied thereto.

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